

High Throughput Hall Thruster for Small Spacecraft, Phase II

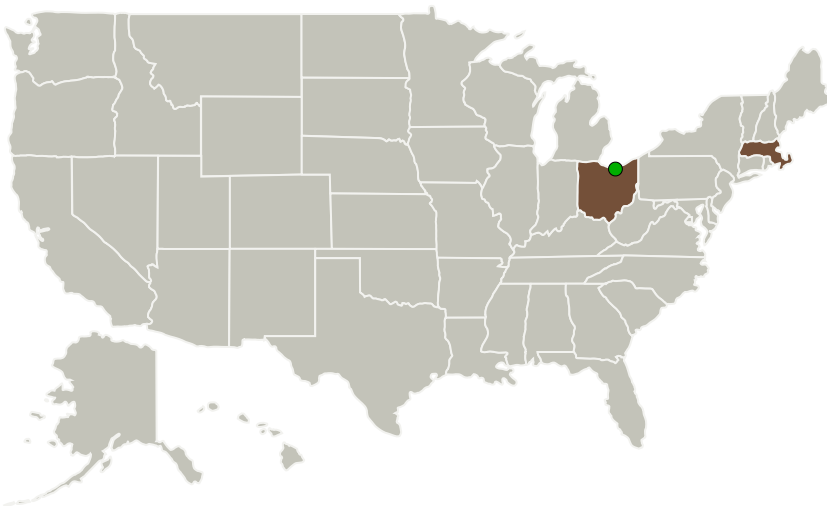
Completed Technology Project (2014 - 2017)



Project Introduction

Busek is developing a high throughput nominal 100-W Hall Effect Thruster. This device is well sized for spacecraft ranging in size from several tens of kilograms to several hundred kilograms. It could be fueled by either xenon or iodine. The latter yields performance like xenon, but stores at low pressure and high density, make it especially attractive for volume limited spacecraft. The available specific impulse will be 1400-1600-s. The target thruster efficiency is 45%. At 100-W and 1500-s, the thrust will be 6.1 mN. The lifetime of the thruster may exceed 10,000 hours, yielding a throughput of greater than 14.9 kg. In Phase I, the thruster was designed. Design considerations included efficiency, specific impulse, temperature, lifetime, mass, volume, and cost. Careful attention to the magnetic field resulted in a "magnetically shielded" shape, which should minimize or entirely eliminate ion wall losses. Testing with a nominal 200-W thruster showed the feasibility and desirability of both permanent magnets and a diamond discharge channel. Permanent magnets save mass, volume, and power. Diamond reduces ion sputtering by 50% with respect to conventional materials. In Phase II, the 100-W thruster and a compact cathode to accompany it will be manufactured, tested, and improved. Performance, lifetime, and plume properties will be evaluated. Testing will include both xenon and iodine. Year 2 development will focus on maximizing throughput. Integrated testing will include a compact, low cost, power processing unit. The technology will reach TRL 5. The program is responsive to NASA topic S3.03, Propulsion Systems. Both the "Electric Propulsion" and "Micro-Propulsion" sub-topics are relevant. The proposal also addresses several of NASA's Grand Challenges, including Efficient In-Space Transportation, Space Debris Hazard Mitigation, and Economical Space Access.

Primary U.S. Work Locations and Key Partners



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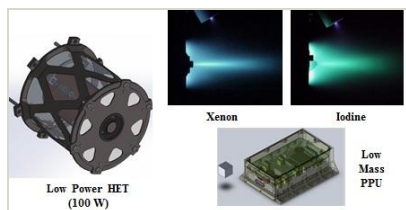


Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Massachusetts	Ohio
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Images



Briefing Chart

High Throughput Hall Thruster for Small Spacecraft, Phase II
(<https://techport.nasa.gov/image/127271>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Szabo

Co-Investigator:

James Szabo

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Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System